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REDUCING
**ENVIRONMENTAL
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IMPACT



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Storage Options for Meeting Peak Load in Nevada

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About NV Energy (History and Overview)



- NV Energy has served citizens in northern Nevada for more than 150 years, and southern Nevada since 1906.
- Today, our service area covers nearly 46,000 square miles of the fastest growing state in the U.S., including the communities of Las Vegas, Reno-Sparks, Henderson and Elko.
- NV Energy provides a wide range of energy services to nearly 1.3 million electric customers throughout the state and more than 50 million tourists annually.
- We also provide natural gas to more than 168,000 citizens in the Reno-Sparks area.
- NV Energy, which is headquartered in Las Vegas, was acquired by Berkshire Hathaway Energy in 2013.
- NV Energy customers continue to benefit from one of the most diverse renewable energy portfolios in the nation, including 15 geothermal projects, 26 solar projects and nearly a dozen wind, biomass, hydro and waste heat renewable energy projects.

About NV Energy (Latest Procurements)

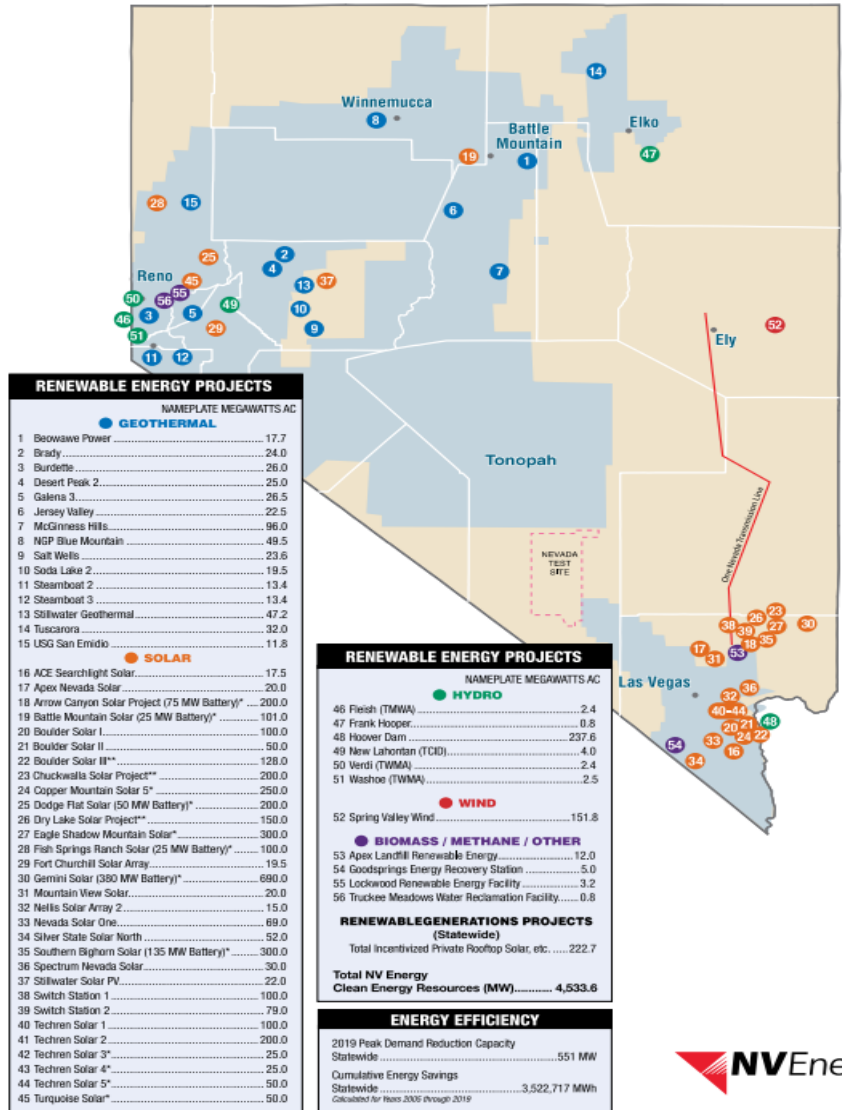


- In 2018, the Public Utilities Commission of Nevada (PUCN) approved NV Energy's Integrated Resource Plan (IRP) for 1,001 megawatts of new renewable energy to be built in Nevada along with 100 megawatts (400 MWh) of battery storage.
- Projects approved in 2018 are scheduled to be complete and serving our customers by the end of 2021.
- 2019 was an important growth year for solar energy, as the PUCN approved NV Energy's IRP to add nearly 1,200 megawatts of new solar energy to be built in the state along with 590 megawatts (2,331 MWh) of additional energy storage.
- The projects approved in 2019 are expected to enter service before January 1, 2024.
- In 2020, NV Energy filed an IRP Amendment that would add another 478 megawatts of new solar along with 338 megawatts (1,352 MWh) of additional energy storage.
- The projects filed in 2020 would enter service before January 1, 2024.
- If this 2020 IRP is approved by the PUCN, NV Energy will have added over 2,600 megawatts of new solar energy and over 1,000 megawatts (4,083 MWh) of energy storage in the last 3 years.

About NV Energy (Renewable Map)



NV Energy's Clean Energy Commitment



* In development or under construction.
** Pending PUCN approval



NV Energy Storage Incentive Program



- NV Energy offers residential customers an incentive of up to \$3,000 for solar-integrated energy storage systems sized from 4 kW to 100 kW capacity
- NV Energy offers commercial customers an incentive of up to \$50,000 per premise for energy storage systems sized 4 kW to 100 kW (small size)
- NV Energy offers commercial customers an incentive of up to \$400,000 per premise for energy storage systems sized 100 kW to 1,000 kW (large size)

NV Energy Renewable Energy Challenge



- Nevada's renewable energy challenge
 - Solar is the most abundant and economic renewable resource in Nevada, however Solar is only available during sunlight hours
 - Renewable Portfolio Standards apply to all hours of the day
 - This creates a mismatch that requires the generation of Portfolio Energy Credits outside of the solar day or the capture of those credits during the solar day via storage
- NV Energy is evaluating other types of renewable / carbon free energy
 - Wind, either generated in Nevada (not an economic resource) or delivered to NV Energy system with Renewable Credits
 - Geothermal, looking to new technologies such as Advanced Geothermal Systems (“AGS”) and Enhanced Geothermal Systems (“EGS”) and/or reducing the risk of single-facility contracts (virtual facilities)
 - Concentrated Solar Power (“CSP”) – newer types of CSP facilities are being developed with different storage technologies
 - Green Hydrogen – has potential in the future but is currently not cost-competitive with alternatives
 - Small Modular Reactors – development is ongoing with this technology, with storage capabilities now being incorporated into the designs

NV Energy Renewable Energy Challenge



- Despite these efforts to find and utilize new sources of renewable generation outside of the solar day, current economic and technological conditions point towards the need for energy storage
 - Energy storage allows for capturing the Portfolio Energy Credits that can be generated during solar hours and used during non-solar hours
 - Energy storage minimizes excess energy generated during the solar hours, thereby reducing requirements to curtail or sell uneconomically (see CAISO)
 - Using this energy during non-solar hours reduces carbon footprint, however;
 - There are energy and credit losses associated with the round-trip efficiency in co-located batteries

NV Energy Storage as a Percent of Required Resources



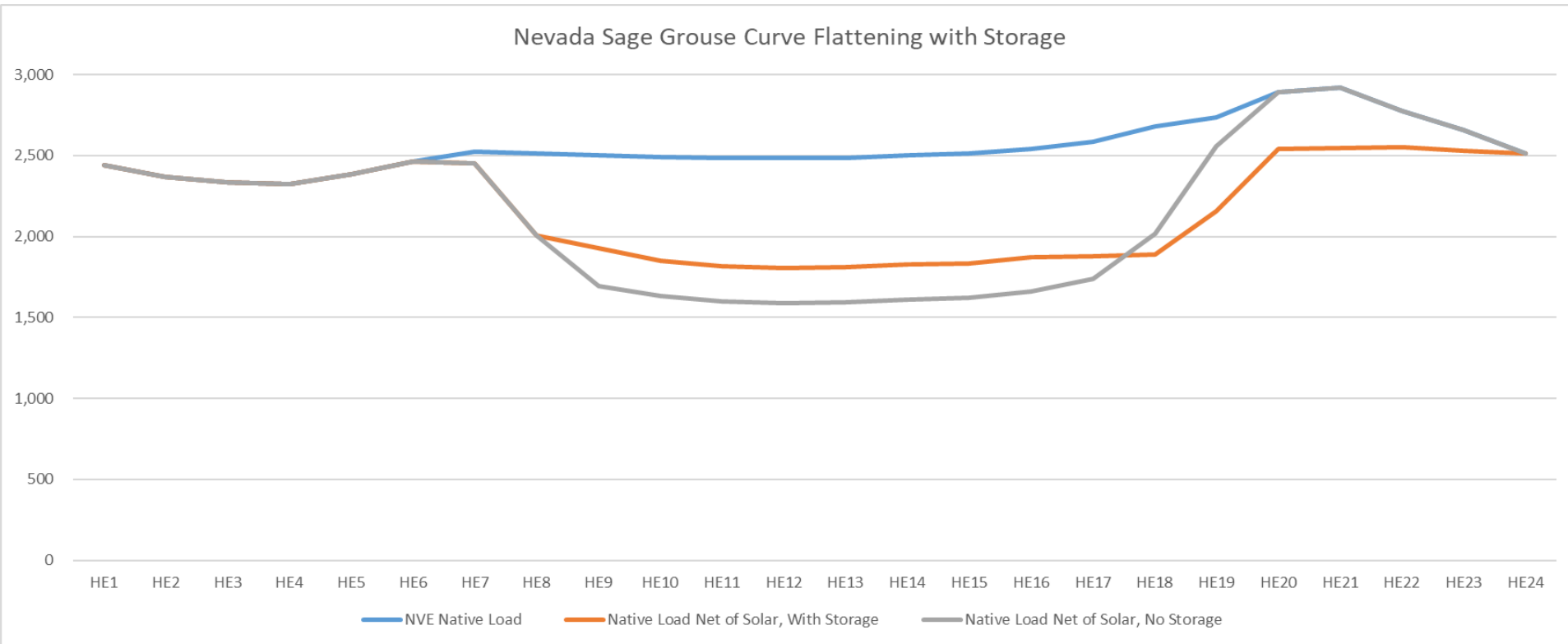
- As filed as part of the 2020 4th Amendment to the IRP, the table below shows the amount of Energy Storage Resources scheduled to be in service by the peak day of the given year, and then the percentage of the required resources the Storage comprises
- There is still time for NV Energy to procure stand-alone energy storage for 2022 and 2023
- NV Energy launched another Renewable Request for Proposal (“RFP”) on October 27, 2020 to add more Solar PV energy with Energy Storage, as well as possibly Geothermal and Wind, to the portfolio

NV Energy Storage Resources Percentage of Required Resources - Including 2020 Filed Projects										
Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Forecast System Peak	7,606	7,587	7,683	7,810	7,887	7,898	7,958	8,025	8,082	8,155
Planning Reserves (13%)	969	963	976	993	1,003	1,003	1,011	1,019	1,026	1,035
Required Resources	8,575	8,550	8,659	8,803	8,890	8,901	8,969	9,044	9,108	9,190
Energy Storage Resources	24	97	171	986	986	980	980	980	980	977
Storage % of Required Resources	0.28%	1.13%	1.97%	11.20%	11.09%	11.01%	10.93%	10.84%	10.76%	10.63%

NV Energy Storage Uses for Peak



- Chart below shows how energy storage can flatten out the “Nevada Sage Grouse” curve, lowering the peak and smoothing the ramps



NV Energy Storage Uses for Peak



- NV Energy realizes that the ability to store intermittent solar and wind energy for later use will play an increasingly important role as the reliance on those resources increases. NV Energy has been actively engaging the developers of several types of energy storage in anticipation of this need. There are several reasons, but addressing capacity open positions and cost-effective shifting of solar generation to evening peak hours are two of those reasons
 - Battery Energy Storage Systems (“BESS”) – NV Energy has taken an early and aggressive position on battery energy storage with procurements as shown in each of the last three Integrated Resource Plan filings
 - Pumped Storage Hydro – is a promising alternative to BESS, since it is a mature technology, with several possible locations within Nevada not far from existing transmission routes and much longer lifespan relative to BESS
 - Hydrogen – has potential in the future but is currently not cost-competitive with alternatives

NV Energy Storage Uses for Peak



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 - Emerging Storage Technologies
 - Gravity Storage – converting the electrical energy into mechanical potential energy, then when needed converting back to electrical energy
 - Thermal Storage – Several technologies, such as concentrated solar, waste heat from combustion sources, heat pumps powered by renewable energy
 - Cold Storage – could include inlet cooling on Combustion Turbines, freezer systems
 - Compressed Air Storage – requires caverns or large tanks
 - Liquified Air Storage – currently commercial in England, requires less tank size than Compressed Air
 - Flywheel Storage – NV Energy has spoken with developers of this technology, waiting for it to be commercial

NV Energy Storage Procurement - Moving Forward



- NV Energy will continue to pursue energy storage for serving load in peak hours and for closing the resource planning open position
- Recent article in Greentech Media quoted Mateo Jaramillo, co-founder of Form Energy, in saying that “It’s time we start moving away from the designation of hours and start describing storage in terms of the function it can provide.”
- Energy storage, as mentioned by Mr. Jaramillo, should be procured to serve a specific need of the system/utility
- Note: NV Energy understands that a 100 MW 4-hour battery might also be used as a 25 MW 16-hour battery, if needed
- If peaking capacity is needed from energy storage, then BESS systems (4-6 -hour durations) seem to bring the most value

NV Energy Storage Procurement - Moving Forward



- If replacing a daily cycling resource (intermediate) is needed from energy storage, then a storage system that can store and then discharge energy for ~16 hours should be procured
- If replacing a base load resource or a variable renewable resource that might lose its “fuel” (i.e. no wind or sun) then a storage resource that can supply energy for days should be procured
- Note: NV Energy understands that adequate amounts of renewable energy must be procured to charge the storage systems

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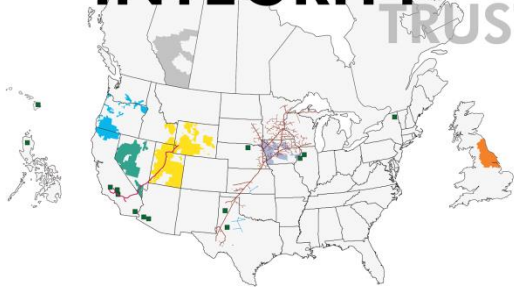
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